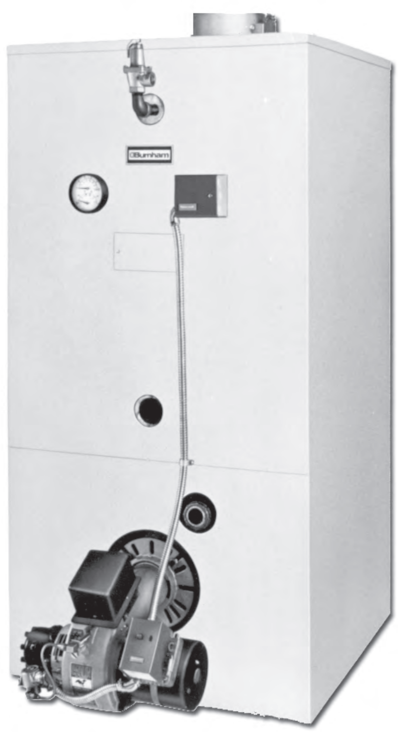
INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

"FD" FORCED DRAFT
STEEL BOILER BURNER UNITS



FOR OIL, GAS OR COMBINATION OIL-GAS FIRING

H

For service or repairs to boiler, call your heating contractor. When seeking information on boiler, provide Boiler Model Number and Serial Number as shown on Rating Label.

Boiler Model Number	Boiler Serial Number	Installation Date
FD ____________	6_ _ _ _ _ _ _	
Heating Contractor		Phone Number
Address		

BURNHAM COMMERCIAL
AMERICA'S BOILER COMPANY

8143401R6-7/03

Price - $3.00

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

WARNING

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

CAUTION

Indicates presence of a hazard which will or can cause minor personal injury or property damage if ignored.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

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INTRODUCTION TO "FD" SERIES STEEL BOILER BURNER UNITS

Due to an excellent combination of boiler and burner, the "FD" Series boiler-burner units are capable of developing the optimum in combustion and thermal efficiencies. The burner provides 12½% CO_2 for a combustion efficiency in excess of 83% on #2 fuel oil. Forced draft operation is accomplished by means of a 3450 RPM motor and blower wheel on the burner and a factory sealed combustion chamber. The commonly used refractory type combustion chamber is not required.

Pressure is produced within the boiler by the "forced draft" operation of the burner eliminating the need for a chimney thus resulting in a substantial savings in building costs. A vent to the outside of the building is the only requirement. Boiler rooms can also be kept to a minimum size since one boiler equipped with a tankless heater can supply all of the heating requirements for comfort heating and domestic hot water.

For optimum performance and serviceability from these units adhere to the following recommendations:

1) Clean boiler flueways (firetubes after removing turbulator baffles) with a 3" OD flue brush, at least once a year and preferably at the end of the heating season, or as may be necessitated to remove all soot and scale. See Page 10 for cleaning instructions.

2) Have burner and controls checked at least once a year. See Pages 14, 15, 21 and 22 and burner manual for burner adjustment specifications.

3) Retain your contractor or a competent service agency to assure that the unit is properly adjusted and maintained.

4) The interior of the venting must be inspected and cleaned before the start of the heating season and should be inspected periodically throughout the heating season for any obstructions. A clean and unobstructed vent is necessary to allow noxious fumes that could cause injury or loss of life to vent safely and will contribute toward maintaining the boiler's efficiency.

For additional information consult the service department.

WARNING

Upon installation of this boiler and at least once a year thereafter the operation of the boiler controls should be checked, particularly the low water cut-off, high limit control and safety-relief valve.

NOTICE

A barometric damper may be required on installations with a high draft condition.

FLUE DAMPER:

The boiler is provided with a breaching damper which should be secured in the open position for initial start up of the burner. The adjustable damper in the flue collar at the boiler outlet is provided so that if the installer or serviceman desires, he can easily introduce a flow restriction at the boiler outlet and thereby increase the pressure in the firebox. Normally, it is best to leave the damper wide open and to control air flow to the burner entirely by adjustments at the burner inlet. Flue restrictions such as a partially closed damper tend to make starts rougher. Boiler tests were run at 12½% CO_2 and 0.1 inches of water stack pressure to demonstrate ample burner air capacity for good performance up to this pressure. Boiler pressure drop does not change measurably at different stack and firebox pressures as long as the burner is adjusted to maintain the same percent CO_2.

MINIMUM INSTALLATION CLEARANCES TO COMBUSTIBLE MATERIAL:

FRONT - 48 Inches
ABOVE OR TOP - 18 Inches
SIDES - 18 Inches
VENT CONNECTOR PIPE - 18 Inches
REAR - 18 Inches

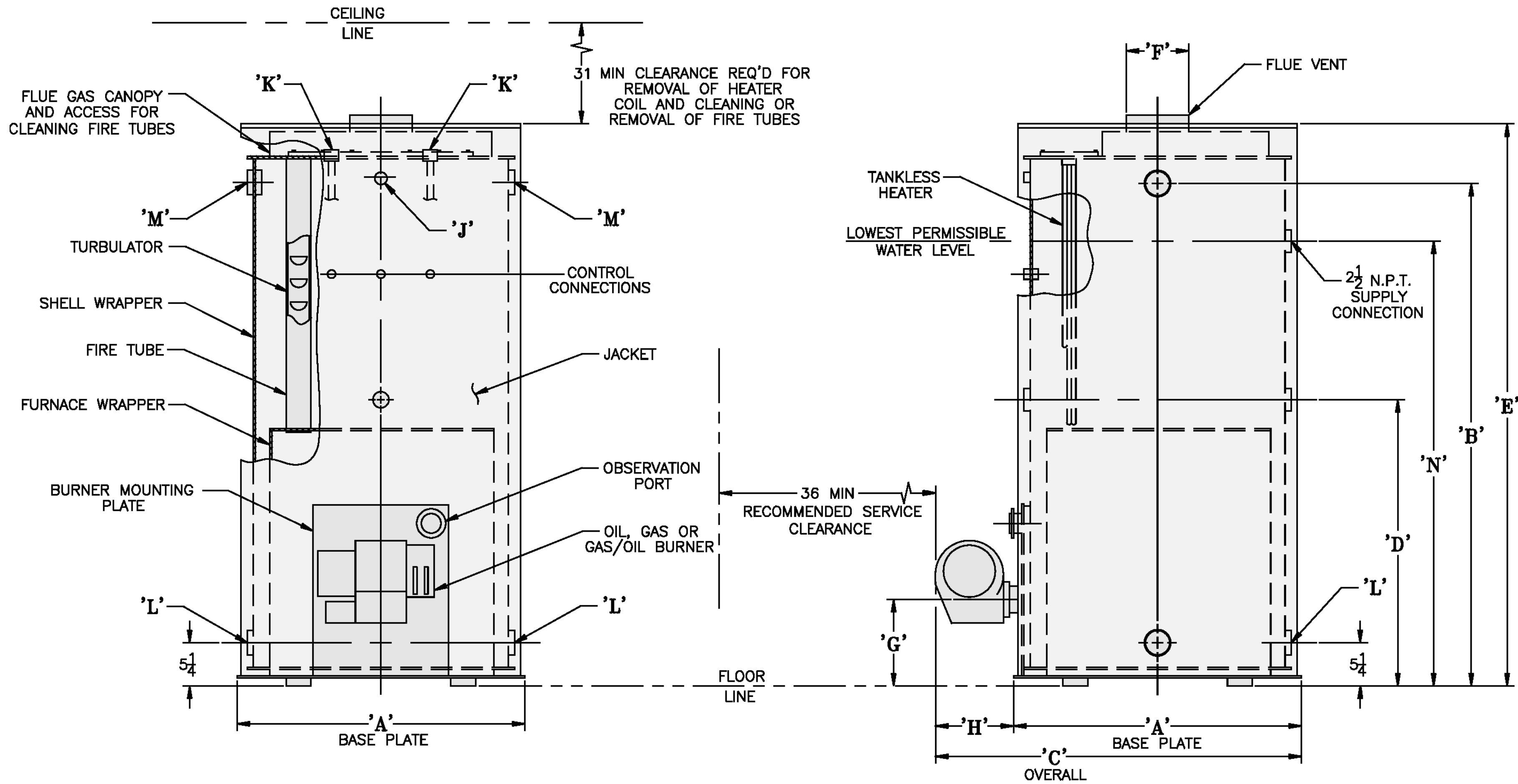
NOTE:

1. Listed clearances comply with American National Standard ANSI/NFPA 31, Installation of oil burning equipment.
2. FD Series boilers can be installed in rooms with clearances from combustible material as listed above. Listed clearances can not be reduced for alcove or closet installations.
3. For reduced clearances to combustible material, protection must be provided as described in the above ANSI/NFPA 31 standard.
4. Check dimensional data for boiler service recommended clearances.

WARNING

Do not support boiler by placing blocks at the four (4) corners of the boiler. Boiler base must be evenly supported under entire base.

Do not operate boiler on combustible floor without a factory supplied floor shield. Concrete over wood joists is considered combustible flooring. Do not operate on masonry floors, which may contain moisture.



FRONT VIEW

RIGHT SIDE VIEW

	DIMENSIONS (IN INCHES)	BOILER MODEL NO.	FD-7	FD-9	FD-10	FD-12	FD-14	FD-15	FD-19	FD-24	FD-30	FD-38	FD-45
		SHELL MODEL NO.	W-300	W-350	W-453	W-504	W-507	W-558	W-680	W-856	W-1062	W-1383	W-1600
'A'	BOILER WIDTH/LENGTH		28	28	32	32	35	35	35	38	44 1/2	48	48
'B'	INSPECTION AND ALTERNATE SUPPLY CONNECTION HEIGHT		49 7/8	55 7/8	56	56	61	61	61	61 1/4	65 1/8	71 1/4	71 1/4
'C'	BOILER LENGTH (INCLUDING BURNER)	OIL	36 3/4	36 3/4	41	41	44 1/4	44 1/4	55 1/4	58 1/4	66 1/4	68 1/2	68 1/2
		GAS	47 1/4	47 1/4	51 1/2	51 1/2	54 3/4	54 3/4	54 3/4	58	68	71 1/2	71 1/2
		GAS/OIL	57	57	61 1/2	61 1/2	64 3/4	64 3/4	64 3/4	68	74 1/2	82 1/2	82 1/2
'D'	1 1/2 N.P.T. INSPECTION CONNECTION HEIGHT (FRONT AND REAR)		31 1/2	31 1/2	28 1/2	28 1/2	34 3/4	34 3/4	34 3/4	33 3/4	37 5/8	43 3/4	43 3/4
'E'	BOILER HEIGHT (TOP OF JACKET)		57 1/4	63 1/4	63 1/4	63 1/4	68 1/4	68 1/4	68 1/4	69 3/4	73 3/4	80	80
'F'	FLUE VENT DIAMETER		8	8	8	8	8	8	8	9	10	10	12
'G'	BURNER HEIGHT (CENTERLINE)		12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	17	17
'H'	BURNER EXTENSION	OIL	8 3/4	8 3/4	9	9	9 1/4	9 1/4	20 1/4	20 1/4	21 3/4	20 1/2	20 1/2
		GAS	19 1/4	19 1/4	19 1/2	19 1/2	19 3/4	19 3/4	19 3/4	20	23 1/2	23 1/2	23 1/2
		GAS/OIL	29	29	29 1/2	29 1/2	29 3/4	29 3/4	29 3/4	30	30	34 1/2	34 1/2
'J'	SAFETY RELIEF VALVE CONNECTION (F.P.T.)		3/4	3/4	3/4	3/4	1	1	1	1	1	1 1/4	1 1/4
'K'	TANKLESS COIL CONNECTION – PIPE SIZE (FD-7/15 F.P.T.) (FD-19/45 M.P.T.)		3/4	3/4	3/4	1	1	1	2	2	2	2	2
'L'	RETURN AND INSPECTION CONNECTION SIZE (F.P.T.)		2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3
'M'	INSPECTION AND ALTERNATE SUPPLY CONNECTION SIZE (F.P.T.)		2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3
'N'	SUPPLY OR OPTIONAL LWCO CONNECTION HT. AND LOWEST PERMISSIBLE WATER LEVEL		42 7/8	48 7/8	49	49	54	54	54	54 1/4	58 1/8	64 1/4	64 1/4
	APPROXIMATE SHIPPING WEIGHT (LBS)	*	1000	1030	1110	1380	1405	1430	1590	1810	2430	3330	3590

* WEIGHT INCLUDES STANDARD GAS BURNER; SUBTRACT 30 LBS FOR STANDARD OIL BURNER; ADD 20 LBS FOR STANDARD GAS/OIL BURNER

RATING DATA	BOILER MODEL NO.	FD-7	FD-9	FD-10	FD-12	FD-14	FD-15	FD-19	FD-24	FD-30	FD-38	FD-45
	SHELL MODEL NO.	W-300	W-350	W-453	W-504	W-507	W-558	W-680	W-856	W-1062	W-1383	W-1600
GROSS OUTPUT – M.B.H.		264	315	355	459	516	574	688	861	1090	1377	1607
GROSS OUTPUT – B.H.P.		7.8	9.4	10.6	13.7	15.4	17.1	20.5	25.7	32.5	41.1	48.0
GROSS OUTPUT – WATER SQ. FT.		1760	2100	2367	3040	3440	3827	4587	5740	7267	9180	10713
NET RATING – WATER M.B.H.	*	229	274	309	399	449	499	598	748	948	1197	1397
NET RATING – WATER SQ. FT.		1527	1827	2060	2660	2993	3327	3987	4987	6320	7980	9313
FIRING RATE – NO. 2 OIL G.P.H. (140,000 BTU/GAL)		2.30	2.75	3.10	4.00	4.50	5.00	6.00	7.50	9.50	12.00	14.00
FIRING RATE – GAS M.B.H. (1000 BTU/FT^3)		331	397	447	577	649	721	865	1082	1370	1730	2019
MAX. TANKLESS HEATER CAPACITY–G.P.M.	**	5	6	7	8	9	10	12	16	20	24	28
WATER CONTENT OF BOILER – GALLONS		44	52	80	77	94	91	87	109	153	189	177
NUMBER OF TUBES – 3" O.D. 12 GA. (EQUIPPED WITH TURBULATORS)		16	16	16	19	22	25	29	32	41	60	72
MAXIMUM ALLOWABLE WORKING PRESSURE (P.S.I. WATER)		30	30	30	30	30	30	30	30	30	30	30
FURNACE VOLUME – CU. FT.		4.8	4.8	6.0	6.0	9.2	9.2	9.2	11.4	18.8	27.6	27.6

* NET RATINGS SHOWN ARE BASED ON A PIPING AND PICKUP ALLOWANCE OF 1.15

** BASED ON 40°F TO 140°F RISE WITH BOILER WATER AT 200°F CONTINUOUS DRAW

FURNACE FLOOR BLANKETS

The furnace floor and the furnace wall below the mud ring are not water backed. These surfaces must be insulated from the intense heat in the furnace. The FD Series boiler now employs precut, refractory ceramic fiber (RCF) blankets to provide this insulation. They are light weight, easy to handle and do not crack like the poured refractory used heretofore.

The blankets must be replaced if they become water logged or lose their thickness or shape for any other reason, such as abuse during firetube cleaning.

BLANKET INSTALLATION

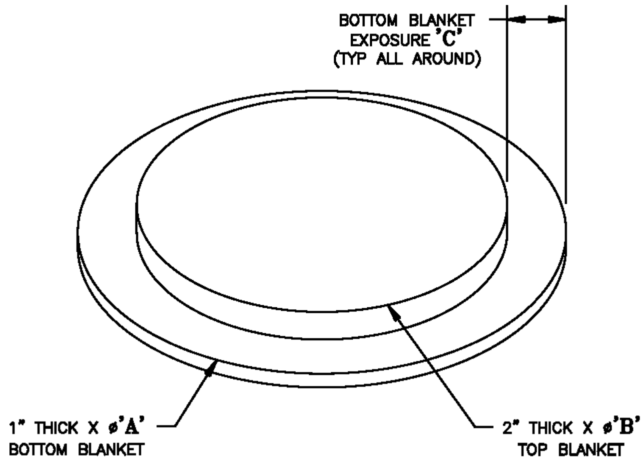
1. Confirm that the blankets are the appropriate size for your FD boiler model using the chart opposite.
2. Unbolt the Burner Mounting Plate from the boiler and set it aside.

WARNING

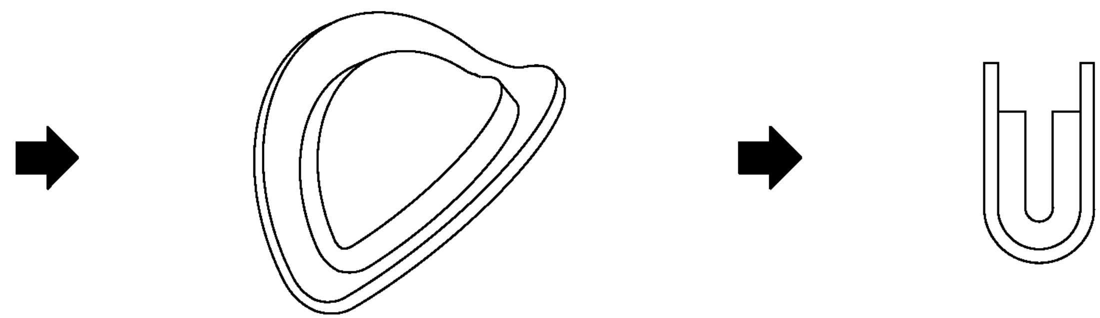
Read the Important Product Safety Information on Page 8 before proceeding.

3. Remove the Burner Mounting Plate Insulation. It may be poured-in-place refractory or precast, lightweight RCF. In either case, it may be reused if removed intact. Replacement, precast, lightweight RCF Burner Mounting Door Insulation is available from Burnham as Part No. 8203401 for Models FD7 through FD30 and as Part No. 8203402 for Models FD38 and FD45.
4. Thoroughly clean any refractory or other insulation out of the furnace.
5. On a flat surface, place the larger diameter 1" thick Bottom Blanket.
6. Lay the smaller diameter 2" thick Top Blanket in the center of the Bottom Blanket. Keep repositioning the Top Blanket until you have equal Bottom Blanket exposure all around the outside edge. See dimension 'C' in the chart opposite and refer to the illustration of blanket placement.
7. Fold the two (2) blankets in half, keeping the Top Blanket centrally positioned on the Bottom Blanket.
8. Slide the folded blankets through the Burner Mounting Plate opening and onto the furnace floor.
9. Unfold the blankets and position the blankets such that the larger diameter 1" thick Bottom Blanket curls up the wall of the furnace by at least 1½" all around the furnace.

   It is important that this curled edge of the Bottom Blanket makes contact with the furnace wall all around to protect the furnace wall from overheating below the mudring. Refer to the illustration of correctly installed blankets.
10. Reinsert the Burner Mounting Plate Insulation and seal all gaps and cracks with ceramic caulking. Ceramic caulking is available from Burnham in 10 ounce tubes (Part No. 9056081) and in gallon pails (Part No. 9056982).
11. Reinstall the Burner Mounting Plate. Since neither the blankets nor the ceramic caulk require cure time, the boiler may be returned to service immediately.

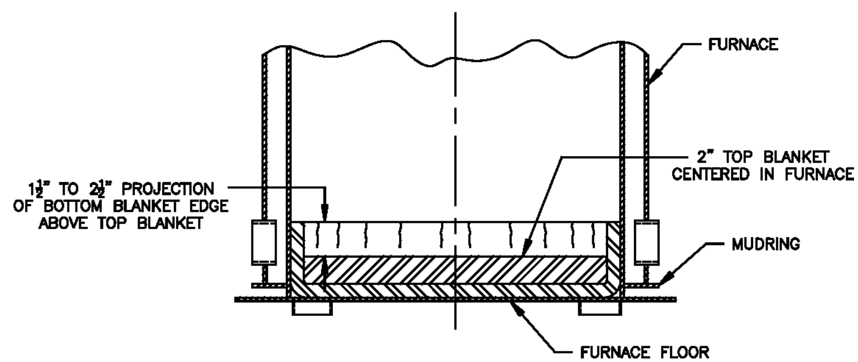


TOP BLANKET PLACEMENT ON BOTTOM BLANKET



FOLDING OF BLANKET IN HALF FOR INSERTION INTO FURNACE

BOILER MODEL	FURNACE INSIDE ø (REF)	1" BOTTOM BLANKET ø 'A' (PART NUMBER)	2" TOP BLANKET ø 'B' (PART NUMBER)	BOTTOM BLANKET EXPOSURE 'C'
7 & 9	20 1/8"	25" (8203409)	18" (8203403)	3 1/2" ± 1/4"
10 & 12	24"	29" (8203410)	22" (8203404)	
14, 15 & 19	27"	32 1/2" (8203411)	25" (8203405)	3 3/4" ± 3/8"
24	30"	36" (8203412)	28" (8203406)	4" ± 1/2"
30	36"	42" (8203413)	34" (8203407)	
38 & 45	40"	46" (8203414)	38" (8203408)	



BLANKETS CORRECTLY INSTALLED IN FD BOILER FURNACE

Important Product Safety Information
Refractory Ceramic Fiber Product

Warning:

This product contains refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. After this product is fired, RCF may, when exposed to extremely high temperature (>1800F), change into a known human carcinogen. When disturbed as a result of servicing or repair, RCF becomes airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

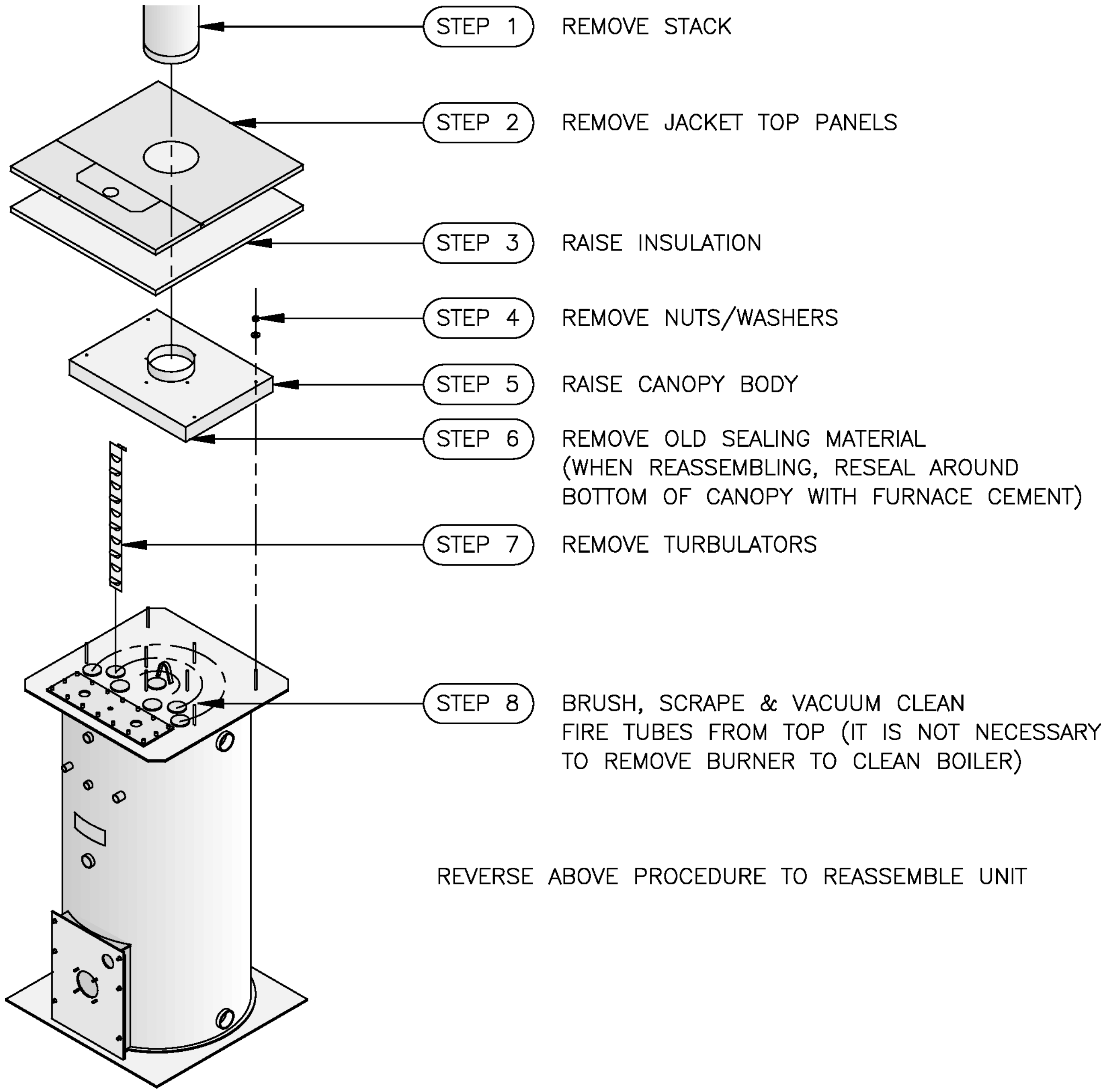
Do not remove or replace previously fired RCF (combustion chamber insulation, target walls, canopy gasket, flue cover gasket, etc.) or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
2. Long sleeved, loose fitting clothing
3. Gloves
4. Eye Protection

- Take steps to assure adequate ventilation.
- Wash all exposed body areas gently with soap and water after contact.
- Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
- Discard used RCF components by sealing in an air tight plastic bag.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.



CLEANING INSTRUCTIONS

FD BURNER SPECIFICATIONS

BOILER MODEL NUMBER: FDO, FDG, FDGO		7	9	10	12
Burner Models & Fuel Burned					
Beckett "CF" (Tube Letter)	#2 Oil	CF500	CF500	CF500	CF800 (A)
Power Flame "CR"	Gas/#2 Oil	CR-1-GO-10	CR-1-GO-10	CR-1-GO-10	CR-1-GO-10
Power Flame "JR"	Gas	JR-15A-10	JR-15A-10	JR-15A-10	JR-15A-10
Burner Motor HP & Voltage - 3450 RPM					
Beckett "CF"		1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1
Power Flame "CR"		1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/2, 120/60/1
Power Flame "JR"		1/4, 120/60/1	1/4, 120/60/1	1/4, 120/60/1	1/4, 120/60/1
Oil Nozzle: Size (GPH), Angle (deg.), Type & Pressure (PSI)					
Beckett "CF"		1.75, 45, P, 150	2.00, 45, P, 150	2.50, 45, P, 150	3.25, 45, P, 150
Power Flame "CR"		1.50, 80, B, 300	1.50, 80, B, 300	1.50, 80, B, 300	2.50, 70, B, 285

POWER FLAME NATURAL GAS

Gas Orifices: Number & Size (Inches or drill size #)		7	9	10	12
Gas Jets	"JR"	(20) 5/16	(20) 5/16	(20) 5/16	(20) 5/16
	"CR"	(30) 7/64	(30) 7/64	(30) 7/64	(30) 7/64
Limiting Orifice Plug	"JR"	11/32	3/32	27/64	15/32
	"CR"	11/32	3/8	13/32	15/32
Pilot Burner - Gas Orifice	"JR"	#48	#48	#48	#48
	"CR"	#36	#36	#36	#36
Gas Pressure Required at Orifice Tee "W.C.	"JR"	3.5	3.1	3.6	3.9
	"CR"	3.3	3.2	3.7	3.7
Standard Gas Control Train Connections N.P.T.	"JR"	1	1	1	1
	"CR"	1	1	1	1

POWER FLAME LIQUID PROPANE

Gas Orifices: Number & Size (Inches or drill size #)		7	9	10	12
Gas Jets	"JR"	(20) 5/16	(20) 5/16	(20) 5/16	(20) 5/16
	"CR"	(30) 7/64	(30) 7/64	(30) 7/64	(30) 7/64
Limiting Orifice Plug	"JR"	11/32	5/16	5/16	11/32
	"CR"	17/64	9/32	5/16	11/32
Pilot Burner - Gas Orifice	"JR"	#48	#48	#48	#48
	"CR"	#48	#48	#48	#48
Gas Pressure Required at Orifice Tee "W.C.	"JR"	3.4	2.8	3.4	3.5
	"CR"	3.3	3.8	3.4	3.4
Standard Gas Control Train Connections N.P.T.	"JR"	1	1	1	1
	"CR"	1	1	1	1

FD BURNER SPECIFICATIONS

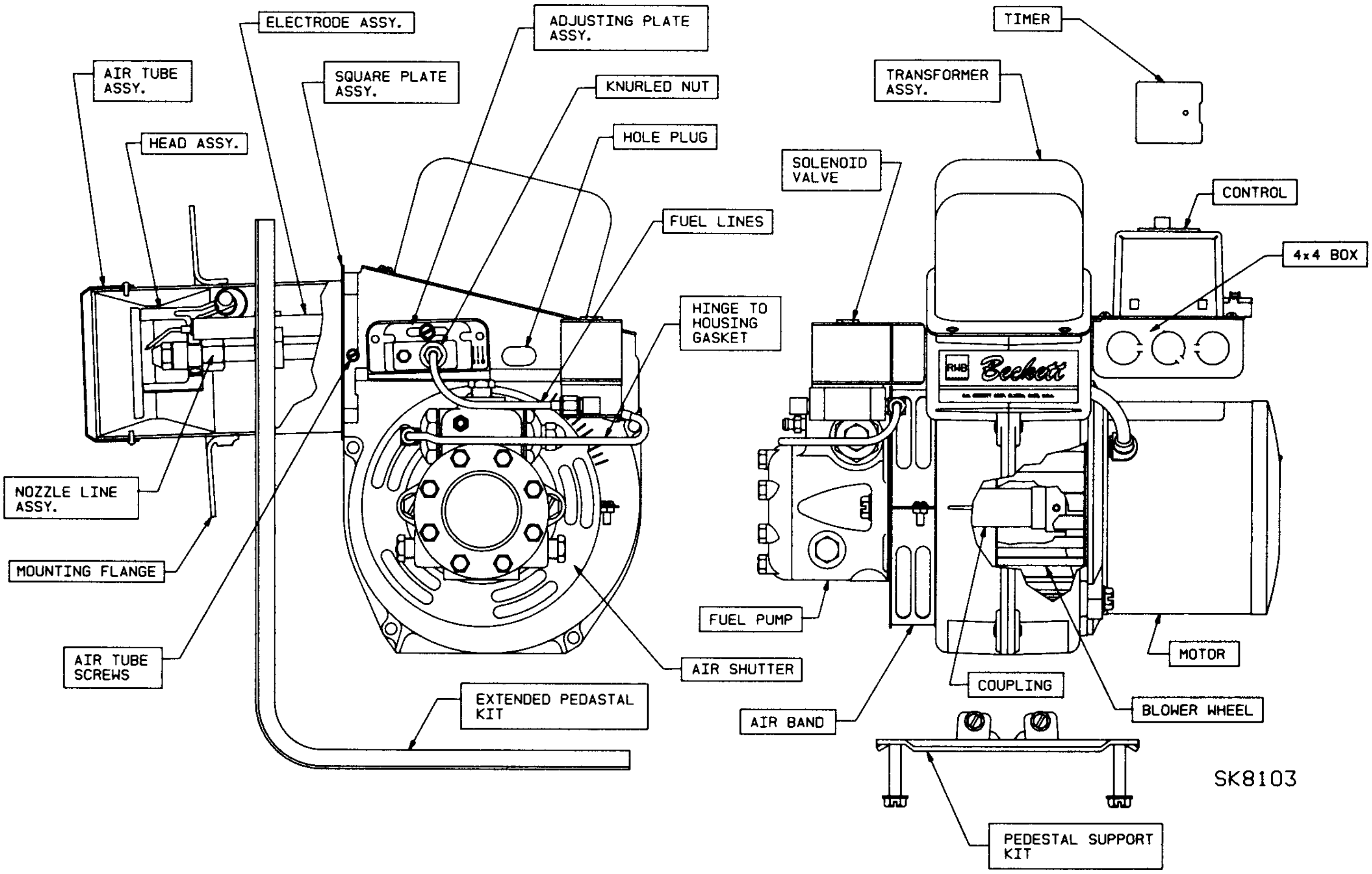
14	15	19	24	30	38	45
CF800 (A)	CF800 (A)	CF800 (A)	CF1400 (A)	CF1400 (A)	CF2300 (A)	CF2300 (A)
CR-1-GO-10	CR-1-GO-10	CR-1-GO-12	CR-1-GO-12	CR-1-GO-12	CR-2-GO-15	CR-2-GO-15
JR-15A-10	JR-30A-10	JR-30A-10	JR-30A-10	JR-50A-15	JR-50A-15	JR-50A-15

1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/2, 120/60/1	1/2, 120/60/1	3/4, 120/60/1	3/4, 120/60/1
1/2, 120/60/1	1/2, 120/60/1	1/2, 120/60/1	1/2, 120/60/1	3/4, 230/60/1	3/4, 230/60/1	3/4, 230/60/1
1/4, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/3, 120/60/1	1/2, 120/60/1

3.75, 45, P, 150	4.00, 45, P, 150	4.50, 60, P, 150	4.50, 45, P, 300	5.50, 45, P, 300	7.00, 45, P, 300	8.00, 45, P, 300
2.50, 80, B, 300	3.25, 70, B, 275	3.50, 70, B, 300	4.50, 70, B, 300	6.50, 70, B, 240	7.00, 70, B, 300	8.50, 70, B, 300

(20) 5/16	(20) 5/16	(20) 5/16	(20) 5/16	(30) #7	(30) #7	(30) #7
(30) 7/64	(30) 7/64	(30) 9/64	(30) 9/64	(30) 9/64	(40) 1/8	(40) 1/8
1/2	5/8	3/4	NONE	3/4	NONE	NONE
1/2	17/32	3/4	NONE	NONE	15/16	NONE
#48	#48	#48	#48	#48	#48	#48
#36	#36	#36	#36	#36	#36	#36
4.3	3.4	4.7	5.4	4.0	4.2	4.3
4.1	4.4	4.5	5.1	3.9	5.3	4.0
1	1	1	1	1-1/2	1-1/2	1-1/2
1	1	1	1	1-1/4	1-1/2	1-1/2

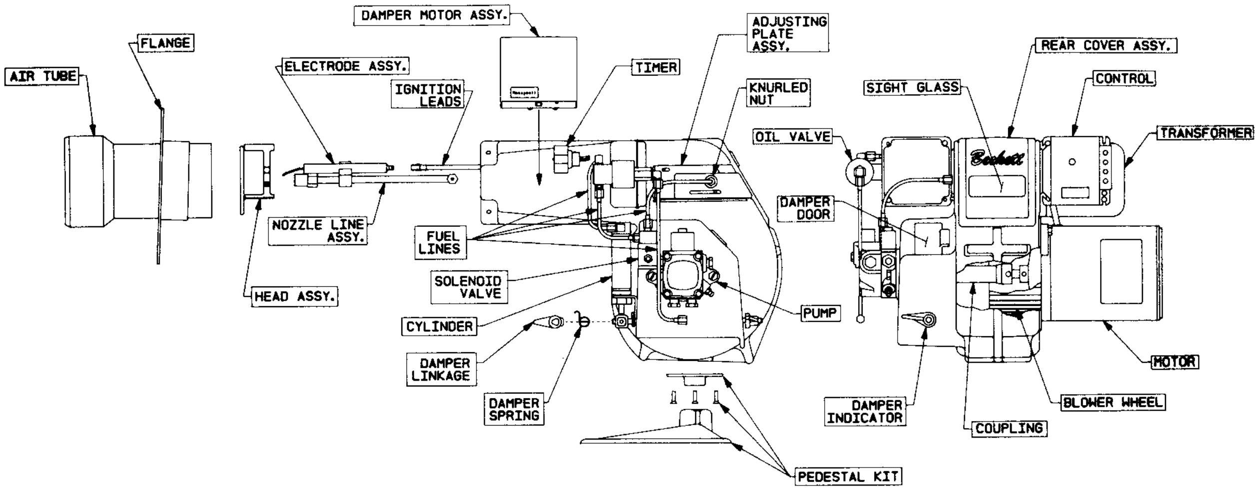
(20) 5/16	(20) 5/16	(20) 5/16	(20) 5/16	(30) #7	(30) #7	(30) #7
(30) 7/64	(30) 7/64	(30) 9/64	(30) 9/64	(30) 9/64	(40) 1/8	(40) 1/8
3/8	13/32	15/32	17/32	17/32	11/16	11/16
3/8	13/32	15/32	1/2	5/8	5/8	3/4
#48	#48	#48	#48	#48	#48	#48
#48	#48	#48	#48	#48	#48	#48
3.6	3.4	3.9	4.2	4.1	3.5	4.4
3.5	3.4	3.8	4.7	3.4	4.3	6.2
1	1	1	1	1-1/2	1-1/2	1-1/2
1	1	1	1	1-1/4	1-1/2	1-1/2



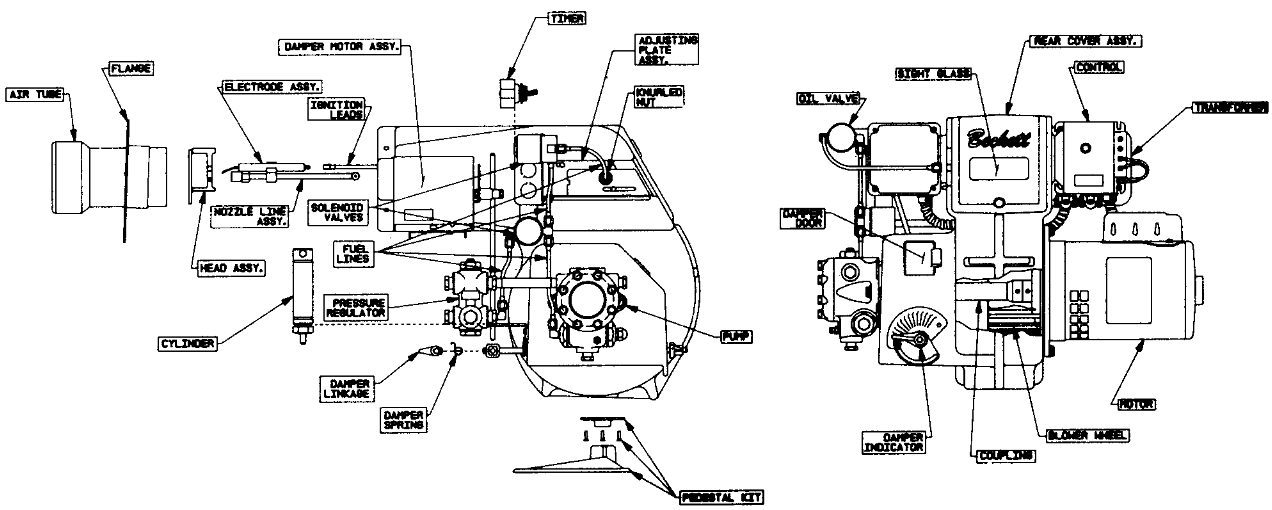
BECKETT CF500/800 OIL BURNER

Boiler Model	Burner Mounting Plate Req.	Burner Model	Firing Rate (G.P.H.)	Fan Size (In.)	Air Tube Combination	Air* Shutter Setting	Air* Band Setting	Head* Setting	Nozzle Data G.P.H.	Nozzle Data Angle	Nozzle Data Type	Nozzle Data Mfg.	Pump Pressure (PSI)
FD7	6023401	CF500	2.3	2.4 x 5.6	CF60KK	0	3.5	1	1.75	45º	P	Hago	150
FD9	6023401	CF500	2.75	2.4 x 5.6	CF60KK	0	4	2	2.0	45º	P	Hago	150
FD10	6023401	CF500	3.1	2.4 x 5.6	CF60KK	0	4	2	2.5	45º	P	Hago	150
FD12	6023401	CF800	4.0	2.4 x 6.3	CF60KH	0	5.5	1.5	3.25	45º	P	Hago	150
FD14	6023401	CF800	4.5	2.4 x 6.3	CF60KH	0	7	2	3.75	45º	P	Hago	150
FD15	6023401	CF800	5.0	2.4 x 6.3	CF60KH	0	8	2	4.0	45º	P	Hago	150
FD19	6023401	CF800	6.0	2.4 x 6.3	CF60KH	2	10	4	4.5	60º	P	Hago	150

*Settings are approximate and must be verified by Smoke and CO_2 measurements. Readjust where necessary.



BECKETT CF1400 OIL BURNER



BECKETT CF2300 OIL BURNER

Boiler Model	Burner Mounting Plate Req.	Burner Model	Firing Rate (G.P.H.)	Fan Size (In.)	Air Tube Combination	Low* Fire Air	High* Fire Air	Head* Setting	Nozzle Data				Pump Pressure	
									G.P.H.	Angle	Type	Mfg.	Low Fire	High Fire
FD24	6023443	CF1400	7.5	3.1 x 5.6	CF60KD	3.0	5.5	3.0	4.5	45º	P	Hago	150	300
FD30	6023443	CF1400	9.5	3.1 x 5.6	CF60KE	3.0	7.5	1.5	5.5	45º	P	Hago	150	300
FD38	6023444	CF2300	12.0	3.1 x 6.8	CF60KG	2.5	4.5	1.0	7.0	45º	P	Hago	150	300
FD45	6023444	CF2300	14.0	3.1 x 6.8	CF60KG	2.5	6.0	1.5	8.0	45º	P	Hago	150	300

*Settings are approximate and must be verified by Smoke and CO_2 measurements. Readjust where necessary.

TANKLESS HEATER PERFORMANCE

Check and if necessary torque coil plate nuts to 25 ft.-lb. max (Do Not Over Torque) before filling system and again after the boiler has been up to operating temperature for several hours.

Tankless heater ratings in the FD boiler are based on continuous draw, temperature rise of 100°F (40-140°F) and boiler water temperature of 200°F. Some of the items effecting the coil performance are as follows:

NOTICE

The following guidelines should be followed when piping the tankless heater:

1. Install Flow Regulator

   If flow through the heater is greater than its rating, the supply of adequate hot water may not be able to keep up with the demand. For this reason a FLOW REGULATOR matching the heater rating should be installed in the cold water line to the heater. Refer to figure below for piping recommendations. Locate the flow regulator below the inlet (cold water side) of the heater and a minimum of 36” away from the inlet so that the regulator is not subjected to excess temperatures during “off” periods when it is possible for heat to be conducted back through the supply line. The flow regulator will limit the flow of supply water regardless of inlet pressure variations ranging from 20 to 125 psi.

2. Install Water Temperature Mixing Valve

WARNING

Install a mixing valve at the tankless heater outlet to avoid risk of burns or scalding due to excessively hot water at fixtures. Do not operate the boiler when equipped with a tankless heater unless mixing valve is operating properly.

a. Adjust and maintain the mixing valve in accordance with manufacturers instructions.

b. Installation of a mixing valve will lengthen the delivery of the available hot water by mixing some cold water with the hot. In addition, savings of hot water will be achieved since the user will not waste as much hot water while seeking desired water temperature.

c. Higher temperature hot water required by dishwashers and automatic washers is possible by piping the hot water from the heater prior to entering the mixing valve.

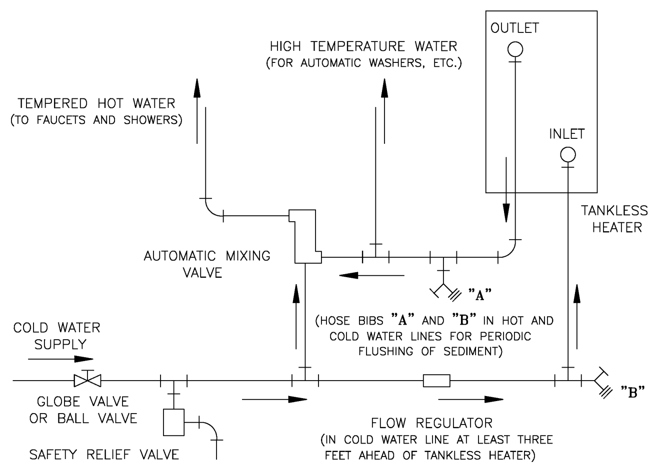
d. The mixing valve should be “trapped” by installing it below the cold water inlet to heater to prevent lime formation in the valve.

3. Flushing of Heater

   All water contains some sediment which settles on the inside of the coil. Consequently, the heater should be periodically backwashed. This is accomplished by installing hose bibs (as illustrated below) and allowing water at city pressure to run into hose bib A, through the heater, and out hose bib B until the discharge is clear. The tees in which the hose bibs are located should be the same size as heater connections to minimize pressure drop.

4. Hard Water

   A water analysis is necessary to determine the hardness of your potable water. This is applicable to some city water and particularly to well water. An appropriate water softener should be installed based on the analysis and dealer’s recommendation. This is not only beneficial to the tankless heater but to piping and fixtures plus the many other benefits derived from soft water.



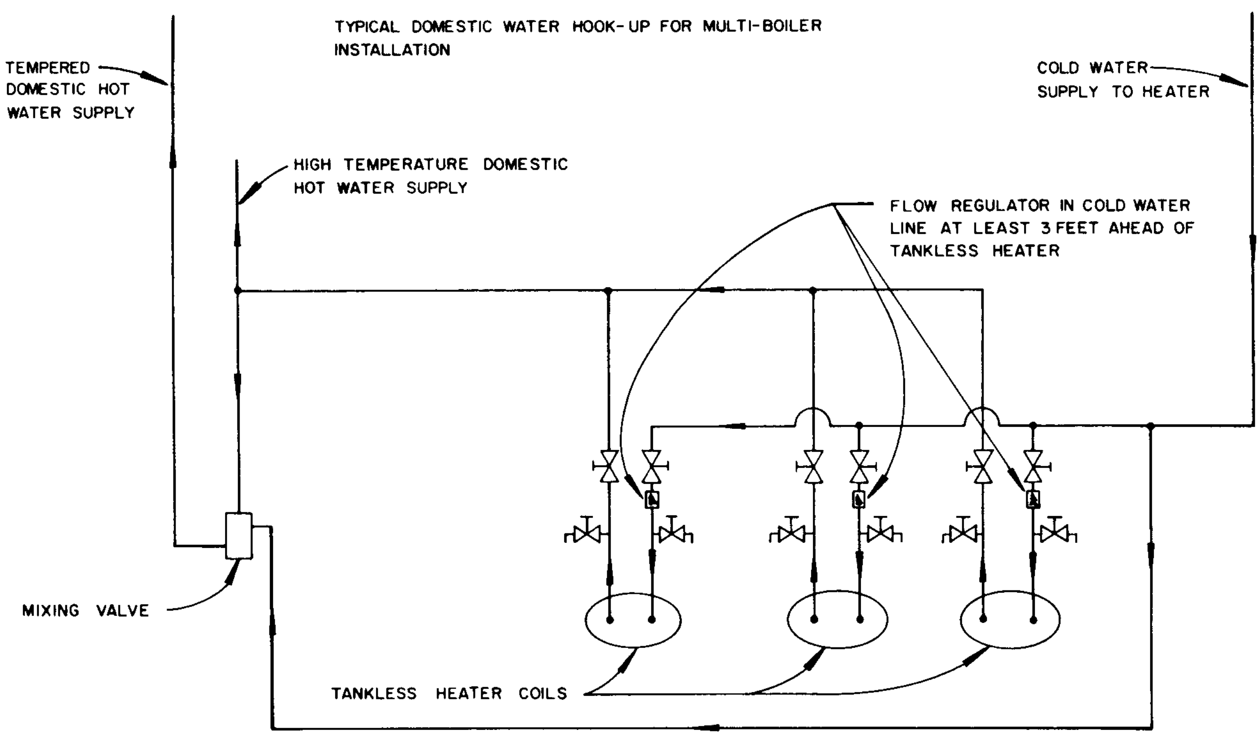
Schematic Tankless Heater Piping

HEATER COILS WHICH WILL FIT BOILER COIL OPENINGS	
Boiler Model	Coils (Rated in GPM @ 100° Rise)
FD10	8-9-10-12
FD12	8-9-10-12
FD14	8-9-10-12-16
FD15	8-9-10-12-16
FD19	8-9-10-12-16
FD24	8-9-10-12-16-20
FD30	8-9-10-12-16-20
FD30	8-9-10-12-16-20
FD38	8-9-10-12-16-20-24-28
FD45	8-9-10-12-16-20-24-28

HEATER RATINGS - "FD" FORCED DRAFT BOILERS				
Boiler Model	Coil No.	Coil Pass	*Gallons Per Hour Based On 100°F Rise	Pressure Drop (P.S.I.) At Flow Rate For 100°F Rise
FD7	A-34A	2	300	10.5
FD9	A-34A	2	360	15.3
FD10	A-34B	2	420	20.8
FD12	3-8	2	480	19.2
FD14	3-9	2	540	27.0
FD15	3-10	3	600	11.0
FD19	3-12	3	720	18.8
FD24	3-16	5	960	8.5
FD30	3-20	5	1200	2.9
FD38	3-24	6	1440	2.9
FD45	3-28	6	1680	6.3

Contact "Application Engineering" for inlet temperatures in excess of 70°F, or if a temperature rise other than 100°F is desired. If pressure drops are found to be excessive, heaters can be over-sized.

*Based on continuous draw with 40°F inlet water



NOTE- HEATER PIPING ARRANGED FOR PARALLEL HOOK-UP TANKLESS HEATER SYSTEM PIPING MUST BE PROPORTIONALLY SIZED

INDIRECT WATER HEATER OPERATION

The Forced Draft Boiler with a tankless heater coil for domestic hot water supply is an efficient and easily maintained system to provide large volumes of domestic hot water. An indirect tankless water heater is one in which domestic water is heated as it passes through a copper coil immersed in hot boiler water. The boiler water is maintained at 200°F or higher and circulates around the outside of the coil transferring boiler water heat to the domestic water in the coil. The domestic water and boiler water are therefore separated, and the domestic hot water provided is totally potable.

The tankless heater coil heats the domestic water instantaneously as it passes through the coil. The coils are designed for a predetermined flow of water in gallons heated per minute. This flow rate should not be exceeded, or the temperature of the domestic hot water will be reduced.

If the domestic hot water demand will exceed the output of the heater, then a storage tank should be considered as illustrated on Page 21. It should be noted that a circulating pump must be used with a storage tank application since the design of a tankless coil prevents the gravity flow of the water. The pump should be of an all-bronze, corrosion-proof construction since continual pumping of fresh water, which contains acids and corrosive substances in varying amounts, frequently causes rapid deterioration of circulator pumps. The storage tank should be sized in accordance with that required to provide the maximum amount of water over a given period of time and allowance should be made for that additional amount of hot water which the heater will provide to replenish that in the tank.

An indirect tankless hot water heater is not recommended for use with a hard water supply unless the water is treated. Use of hard water in a tankless coil results in internal mineral scaling and progressively will build up to the point of total obstruction. It is recommended that the local water supply be checked and treated as may be recommended.

VENTILATION AND COMBUSTION AIR — When the boiler is installed in an unconfined space in a building of unusually tight construction, a single opening in an outside wall shall be provided and furnished with a properly louvered metal sleeve. This opening shall have a free area of not less than one (1) square inch for each five thousand (5000) Btu per hour total input rating on all appliances.

When the Boiler is installed in a confined space, one of the following provisions must be made to insure adequate air for ventilation and combustion:

a. Two openings in a wall to an adjoining interior area which has adequate air supply from outdoors. One opening should be near the floor and the other near the ceiling. Each shall have a free area of not less than one (1) square inch for each thousand (1000) Btu per hour input to all appliances in the boiler room.

b. Two openings to outdoors or to spaces (crawl or attic) that freely communicate with outdoors. One opening should be in or near the ceiling and one should be in or near the floor, and each shall have a free area of not less than one (1) square inch for each four thousand (4000) Btu per hour total input. Horizontal ducts may be used if the free area is not less than one (1) square inch for two thousand (2000) Btu per hour total input and minimum duct dimension is 3” or more.

c. Two openings through an interior wall (located and sized as in provision (a) above) and an additional opening to outdoors (as in provision (b) above) in or near the floor having a free area of not less than one (1) square inch for each five thousand (5000) Btu per hour total input.

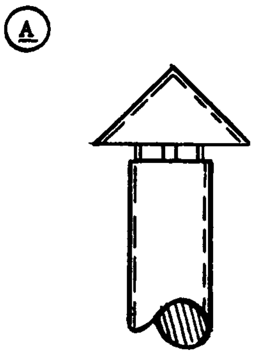
COMBUSTION AND VENTILATION AIR REQUIREMENTS FOR BOILER ROOMS — MINIMUM AIR TO ACCOMMODATE FORCED DRAFT BOILER-BURNER UNITS

The boiler room must have an adequate air supply to permit clean, safe combustion, and to minimize soot formation. An unobstructed direct air opening of the sizes listed below should be provided.

GAS OR OIL	
Boiler Model	Direct Opening to Outside Air-Net Sq. In.
FD7	67
FD9	80
FD10	90
FD12	116
FD14	130
FD15	145
FD19	173
FD24	217
FD30	274
FD38	346
FD45	404

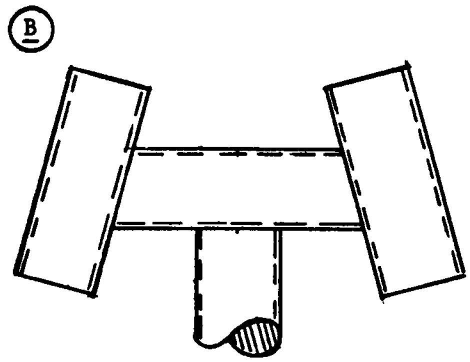
VENTS — FAULTS & SUGGESTIONS

TYPICAL VENTS THAT ARE USED ON FORCED DRAFT BOILERS, ON LOW SILHOUETTE BUILDINGS.



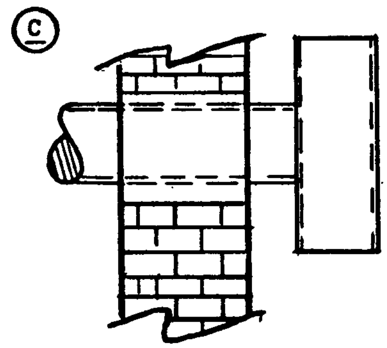
CHINESE HAT

RIGHT



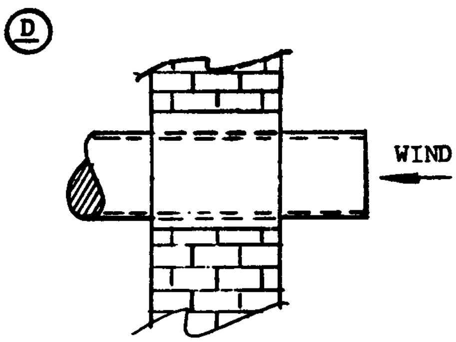
"A"CAP

RIGHT



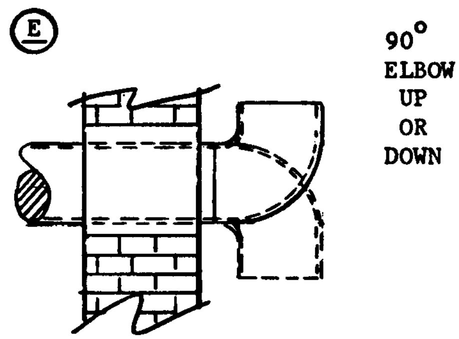
TEE TYPE

RIGHT



WRONG

BOILER SIZE Gross Output MBH	BOILER VENT DIA.	AREA SQUARE INC.
250	8”	51”
300	8”	51”
350	8”	51”
439	8”	51”
507	8”	51”
558	8”	51”
680	8”	51”
856	9”	64”
1062	10”	79”
1383	10”	79”
1600	12”	114”



WRONG

VENT SIZING - AREA MUST BE THE SAME AS OR GREATER THAN THE BOILER BREECHING (Smoke outlet). A BAROMETRIC DAMPER MAY BE REQUIRED ON INSTALLATIONS WITH A HIGH DRAFT CONDITION.

FAULTY BOILER BURNER OPERATION

1. IF IMPROPER VENT IS SUSPECTED, REMOVE PIPE AT BREECHING AND OPERATE BOILER. THIS WILL DETERMINE IF EXCESSIVE DOWN DRAFT, BLOCKED OR RESTRICTED FLUE, ETC. IS CAUSING PROBLEM.
2. IF USING TYPE SHOWN IN A. ABOVE, BE SURE CAP IS RAISED SUFFICIENTLY ABOVE MAIN PIPE TO ALLOW FLUE GASES TO VENT UNIMPEDED.
3. A POPULAR TYPE CAP IS SHOWN IN B.
4. THE TEE IS FREQUENTLY USED AS SHOWN IN C.
5. D. AND E. SHOULD NOT BE USED DUE TO POSSIBLE FLUCTUATIONS IN BACK PRESSURE.

EXPANSION OR AIR CUSHION TANK

It is necessary to make provision for the increased volume of water in the boiler and heating system caused by thermal expansion. This is accomplished by installing an expansion tank. The tank is usually located above the boiler with a piping connection between the bottom of the tank and the top of the boiler.

When the boiler and system is initially filled with water, a pocket or cushion of air is trapped within the tank. This air cushion provides the additional space required to accommodate the increased volume of water caused by thermal expansion. The use of an expansion tank permits operation through all ranges of boiler water temperature, including temperatures above 212ºF without opening the safety-relief valve.

EXPANSION TANK SIZING

FD	7	9	10	12	14	15	19	24	30	38	45
*Expansion Tank Size (No Heating System)	12" x 30"	12" x 30"	12" x 36"	12" x 36"	12" x 48"	12" x 48"	12" x 48"	12" x 48"	14" x 60"	14" x 60"	14" x 60"
*Expansion Tank Volume - Gal. (No Heating System)	15	15	18	18	24	24	24	24	40	40	40
Water Volume in Boiler Shell - Gal.	44	52	80	77	94	91	87	109	153	189	177

*When boiler is used to heat domestic water only.

NOTES:

1. If the boiler is used for space heating, the heating system water volume must be added to the boiler water volume in order to determine the expansion tank requirements.
2. Before selecting expansion tank, consult local authorities to determine ASME or State requirements.
3. There are occasions in operation when the expansion tank becomes “waterlogged” or filled with water. When this occurs, it is necessary to close the stop valve to the boiler and open the draw valve on the tank. When the water is completely drained and the tank is again filled with air, close the drain valve and open the valve to the boiler.
4. It may be more economical to use the pressurized air cushion tank rather than the conventional type expansion tank listed above. When selecting a pressurized air cushion tank, consult your dealer.

OXYGEN CORROSION

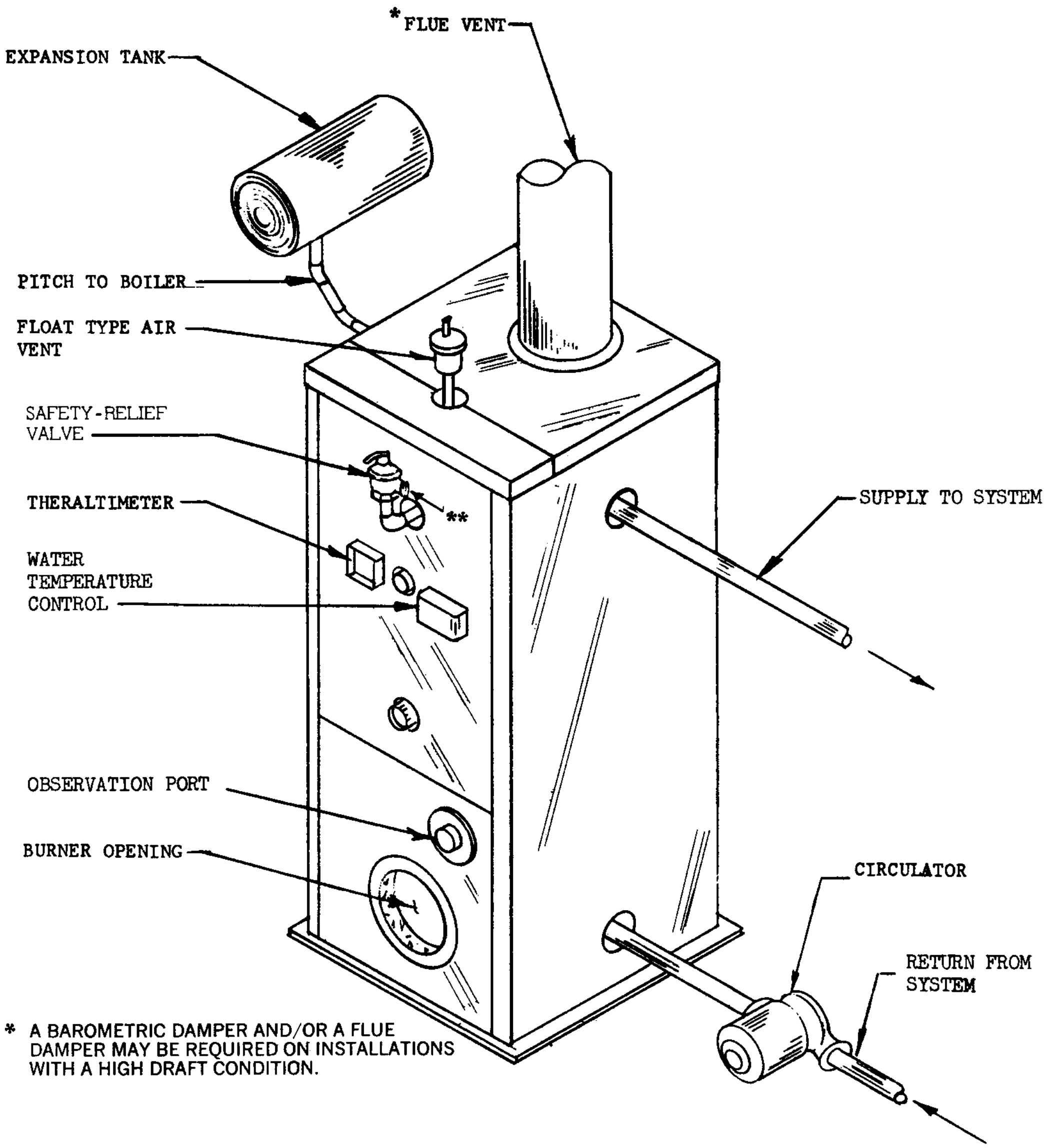
Oxygen contamination of the boiler water will cause corrosion of the iron and steel boiler components, which can lead to failure. As such, any system must be designed to prevent oxygen absorption in the first place or prevent it from reaching the boiler. Problems caused by oxygen contamination of boiler water are not covered by Burnham's standard warranty.

There are many possible causes of oxygen contamination such as:

1. Addition of excessive make-up water as result of system leaks.
2. Absorption through open tanks and fittings.
3. Oxygen permeable materials in the distribution system.

In order to insure long product life, oxygen sources should be eliminated. This can be accomplished by taking the following measures:

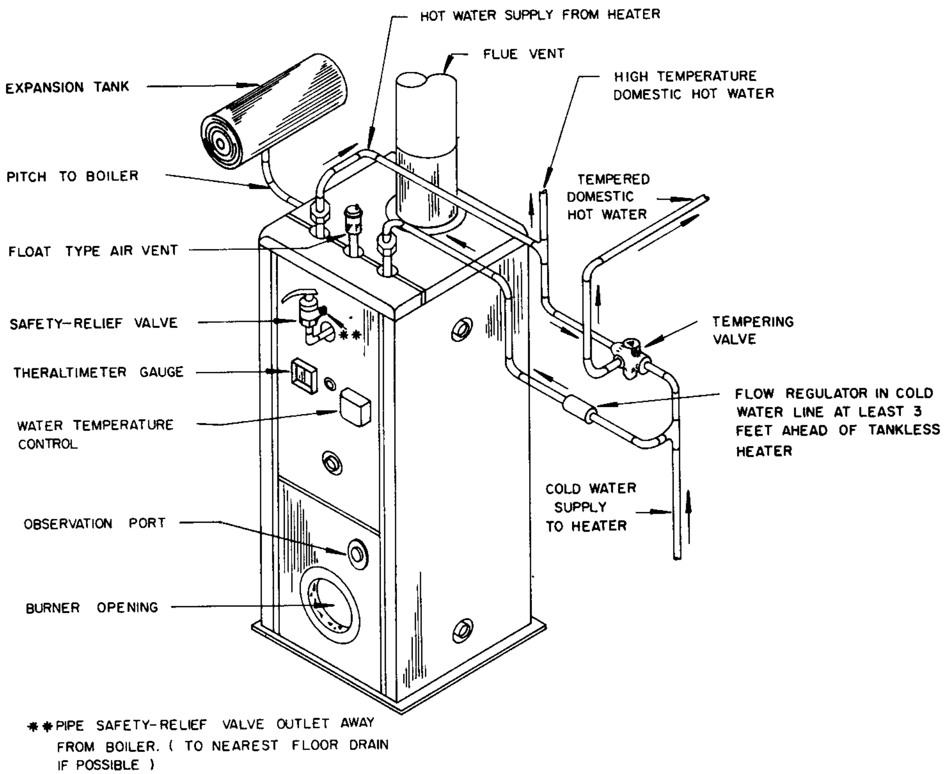
1. Repairing system leaks to eliminate the need for addition of make-up water.
2. Eliminating open tanks from the system.
3. Eliminating and/or repairing fittings which allow oxygen absorption.
4. Use of non-permeable materials in the distribution system.
5. Isolating the boiler from the system water by installing a heat exchanger.



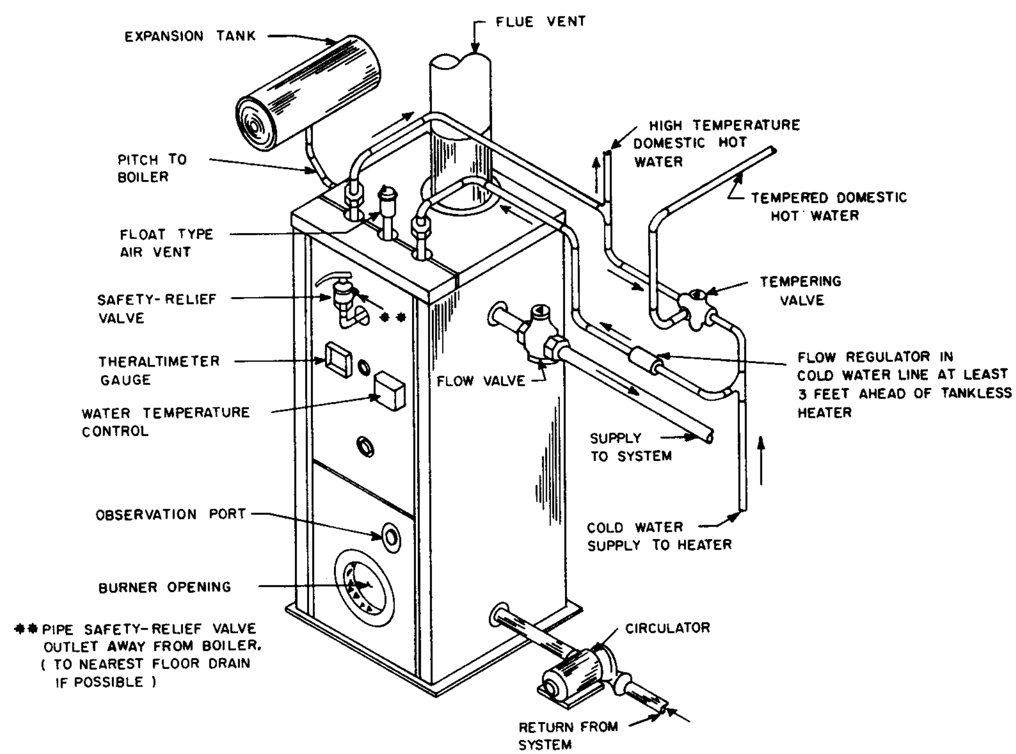
* A BAROMETRIC DAMPER AND/OR A FLUE DAMPER MAY BE REQUIRED ON INSTALLATIONS WITH A HIGH DRAFT CONDITION.

TYPICAL PIPING RECOMMENDATIONS FOR
FORCED HOT WATER HEATING WITHOUT TANKLESS HEATER

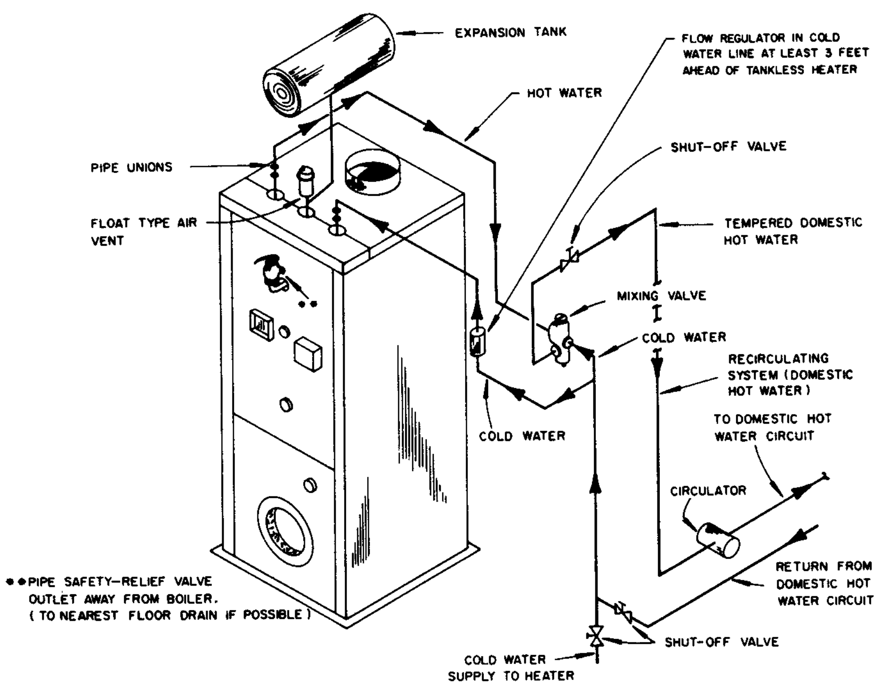
** PIPE SAFETY-RELIEF VALVE OUTLET AWAY FROM BOILER. (TO NEAREST FLOOR DRAIN IF POSSIBLE)



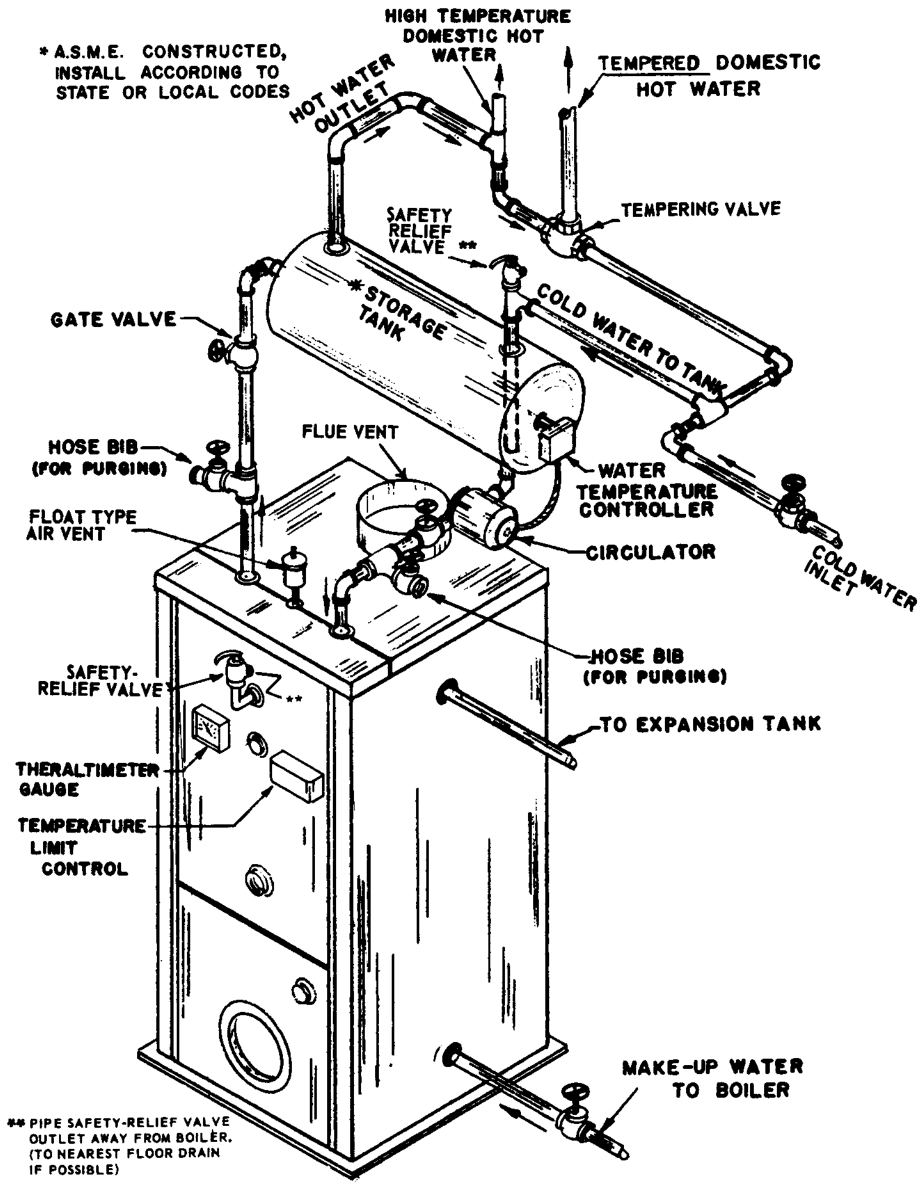
TYPICAL PIPING RECOMMENDATIONS FOR
DOMESTIC HOT WATER ONLY



TYPICAL PIPING RECOMMENDATION FOR FORCED HOT
WATER HEATING AND DOMESTIC HOT WATER HEATING

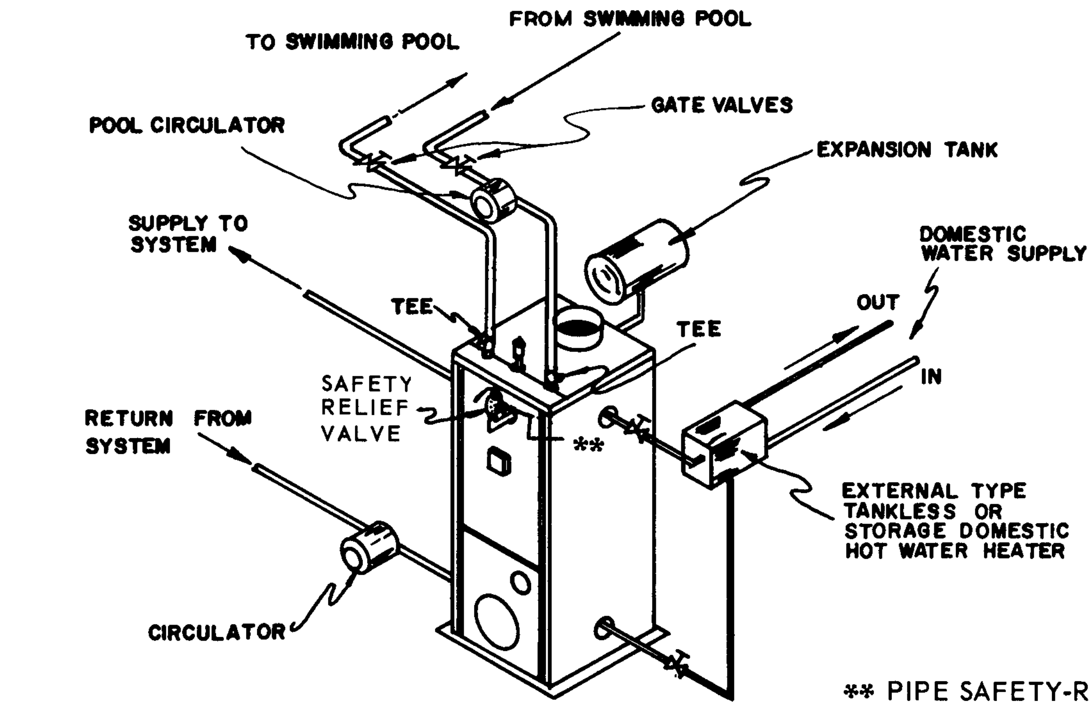


TYPICAL PIPING RECOMMENDATIONS
FOR RECIRCULATING DOMESTIC HOT WATER SYSTEM

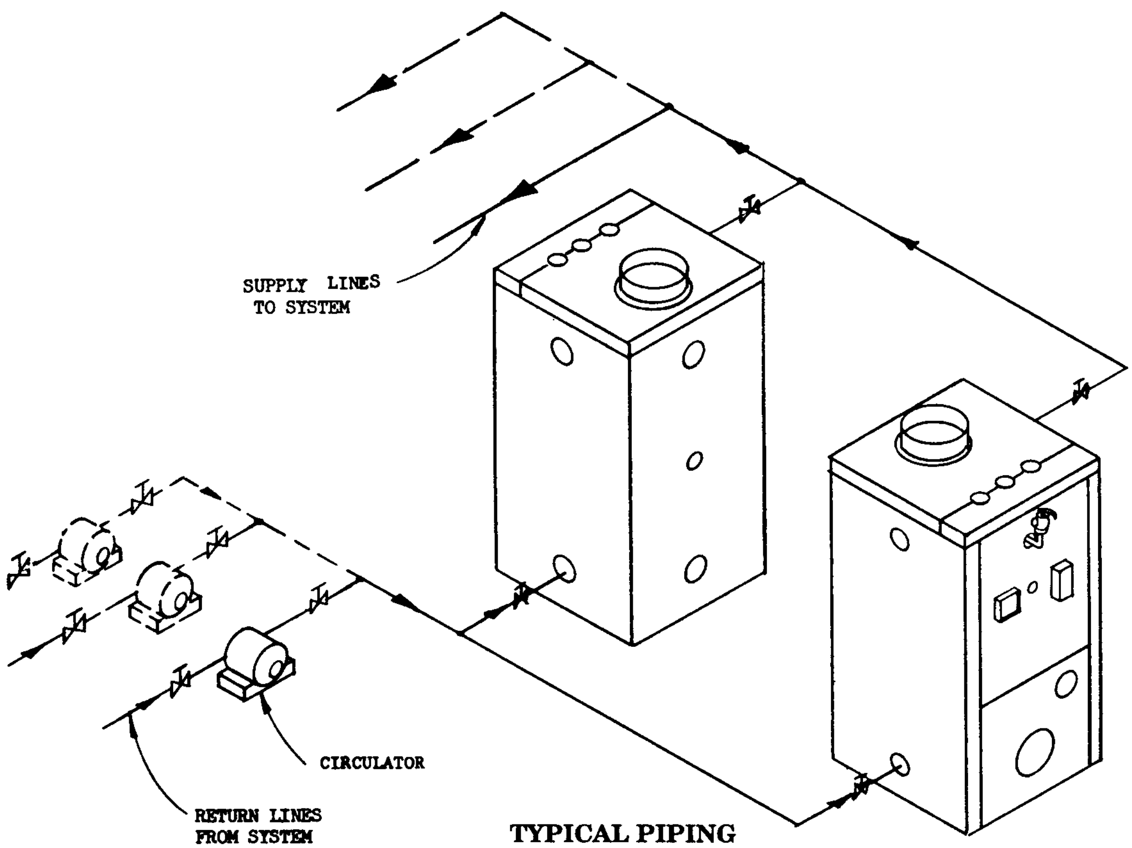


TYPICAL PIPING RECOMMENDATIONS FOR DOMESTIC HOT WATER
WITH
STORAGE TANK INSTALLATION

TYPICAL PIPING RECOMMENDATIONS FOR MULTI-PURPOSE BOILER APPLICATION WITH RESIDENTIAL HEATING, DOMESTIC HOT WATER AND <u>SWIMMING POOL WATER HEATING</u>

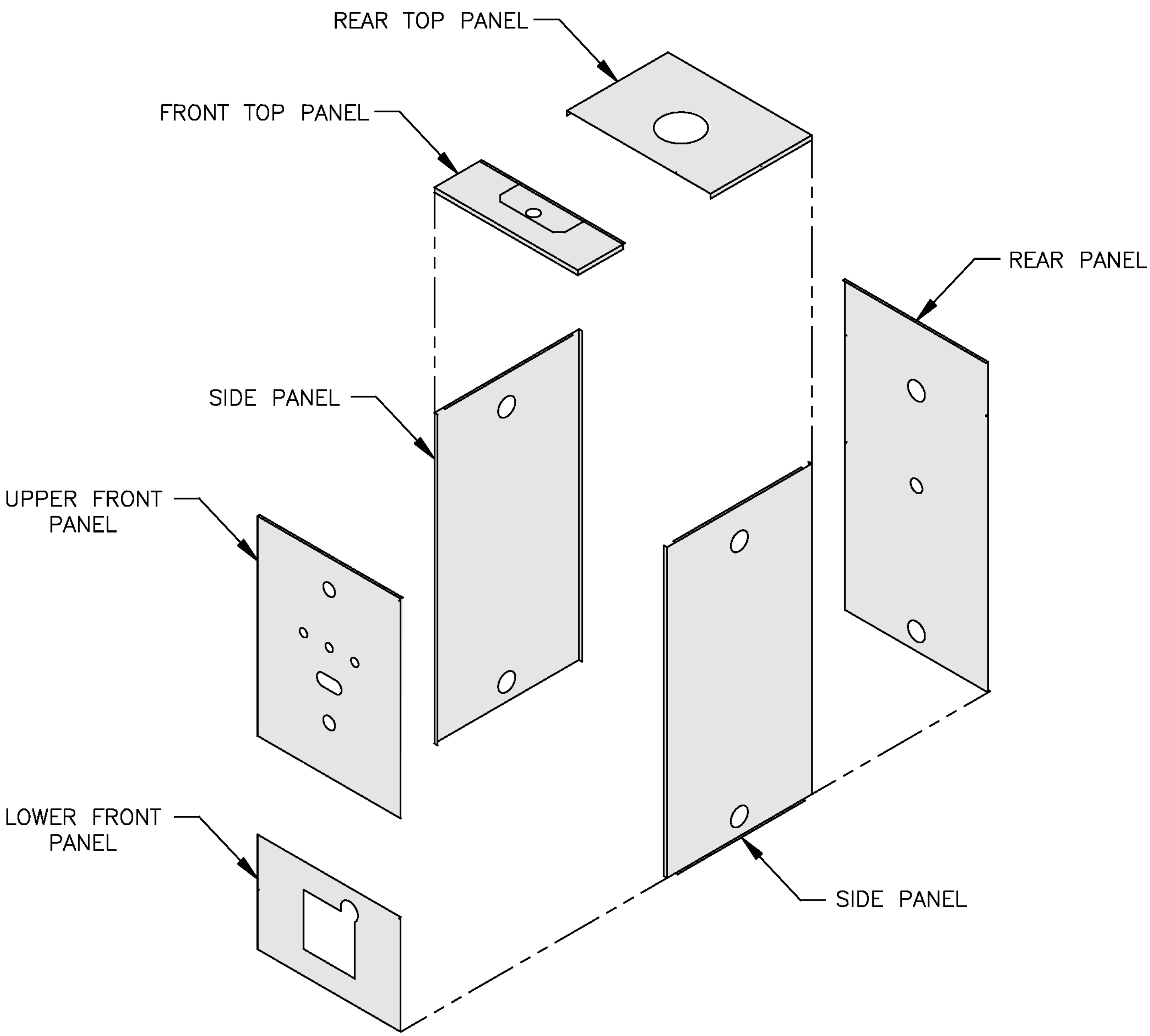


** PIPE SAFETY-RELIEF VALVE OUTLET AWAY FROM BOILER. (TO NEAREST FLOOR DRAIN IF POSSIBLE)



TYPICAL PIPING RECOMMENDATIONS <u>FOR MULTIPLE BOILER OPERATIONS</u>

All FD Series Repair Parts may be obtained through your local Burnham Wholesale distributor. Should you require assistance in locating a Burnham Distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.



When ordering repair parts, refer to: (1) the part description on this page or page 4, (2) the Boiler Model Number and (3) the Boiler Serial Number.

Limited Warranty

FD SERIES™

Limited Warranty **– Except as provided below with respect to products or parts not manufactured by Burnham Commercial™,** Burnham Commercial warrants to the original owner at the original installation site that products manufactured by Burnham Commercial, America's Boiler Company comply, at the time of manufacture, with recognized Hydronics industry regulatory agency standards and requirements then in effect and will be free from defects in materials and workmanship for a period of one year after the date of installation.

The remedy for breach of this warranty is expressly limited to the repair or replacement of any part found to be defective under conditions of normal use and does not extend to liability for incidental, special or consequential damages or losses such as loss of the use of the products, inconvenience, loss of time or labor expense involved in repairing or replacing alleged defective product. Burnham Commercial shall have no responsibility for the performance of any product sold by it under conditions varying materially from those under which such product is usually tested under existing industry standards, nor for any damage to the product from abrasion, erosion, corrosion, deterioration or the like due to abnormal temperatures or the influence of foreign matter or energy, nor for the design or operation of any system of which any such product may be made a part or for the suitability of any such product for any particular application.

For products or parts not manufactured by Burnham Commercial, the warranty obligation of Burnham Commercial shall, in all respects, conform and be limited to the warranty actually extended to Burnham Commercial by its vendors.

Warranty service can be obtained by contacting the original installer of the product and providing them with a detailed description of any apparent defect. If this procedure fails to result in satisfactory warranty service, the owner should notify Burnham Commercial, America's Boiler Company, P.O. Box 3939, Lancaster, PA 17604. Transportation to a factory or other designated facility for repairs of any products or items alleged defective shall, in all events, be the responsibility and at the cost of the owner.

Not with standing any of the above provision, (1) failures resulting from misuse, improper installation or lack of maintenance are not covered by this warranty, and (2) Burnham Commercial's liability under this warranty shall not exceed the selling price of the product found to be defective.

Equipment furnished by the Buyer, either mounted or unmounted, and when contracted for by the Buyer to be installed or handled is not covered by this warranty. Burnham Commercial does not assume any responsibility in connection with such equipment, operation, warranty, performance, or any other liability connected thereto.

Then foregoing provisions of this WARRANTY shall be effective to the maximum extent permitted by applicable law, and, to the extent that any such provision would otherwise have an unconscionable result or would otherwise be inconsistent with applicable law, such provision shall be limited in effect to the minimum extent necessary to avoid such unconscionable result or inconsistency with applicable law.

Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose shall, to the extent permitted by applicable law, be limited in duration to a period of one year after the date of installation. To the extent permitted by applicable law, the remedies for breach of any such implied warranty shall be limited to the remedies set forth above with respect to a breach of the express limited warranty provided. With respect to the limitations on implied warranties set forth above, Burnham Commercial hereby notifies each person to whom such warranty is made as follows: Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations, or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

BURNHAM® COMMERCIAL
AMERICA'S BOILER COMPANY

03/03